

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 15 June 2001 (15.06.01)	Applicant's or agent's file reference 3419-380
International application No. PCT/CA00/01067	Priority date (day/month/year) 22 September 1999 (22.09.99)
International filing date (day/month/year) 22 September 2000 (22.09.00)	
Applicant HLIBOWICKI, Stefan, R. et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 10 April 2001 (10.04.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Odile ALIU Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

NEUMANN, Ernst, D.
Harwardt Neumann
Brandstrasse 10
53721 Siegburg
ALLEMAGNE

Date of mailing (day/month/year) 20 April 2001 (20.04.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference P98043W010	
International application No. PCT/EP00/08229	International filing date (day/month/year) 23 August 2000 (23.08.00)

1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representative

Name and Address

GKN AUTOMOTIVE AG
Hauptstrasse 150
53797 Lohmar
Germany

State of Nationality

DE

State of Residence

DE

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☒ the name ☐ the address ☐ the nationality ☐ the residence

Name and Address

GKN AUTOMOTIVE GMBH
Hauptstrasse 150
53797 Lohmar
Germany

State of Nationality

DE

State of Residence

DE

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office ☐ the designated Offices concerned
☐ the International Searching Authority ☒ the elected Offices concerned
☒ the International Preliminary Examining Authority ☐ other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

Céline Faust

Facsimile No.: (41-22) 740.14.35

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

(PCT Rule 44.1)

To:

BERESKIN & PARR
40 King Street West, 40th Floor
TORONTO, ONTARIO M5H 3Y2
CANADA

Date of mailing (day/month/year)	25/10/2001
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Applicant's or agent's file reference 3419-380	FOR FURTHER ACTION See paragraphs 1 and 4 below
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International application No. PCT/CA 00/01067	International filing date (day/month/year) 22/09/2000
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Applicant

AUDIO PRODUCTS INTERNATIONAL CORP. et al.

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after 18 months from the priority date, the international application will be published by the International Bureau.

If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis*.1 and 90*bis*.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within 20 months from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority	Authorized officer
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European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Véronique Cornudet-Henschel

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 3419-380	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/CA 00/ 01067	International filing date (day/month/year) 22/09/2000	(Earliest) Priority Date (day/month/year) 22/09/1999
Applicant AUDIO PRODUCTS INTERNATIONAL CORP. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

☒ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA 00/01067

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-6

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1-6

Claim 1 relates to a loudspeaker system comprising:

- a first speaker assembly;
- a second speaker assembly; and
- a coupling means providing mechanical interconnection between the first and second speaker assemblies.

According to claim 4 the coupling means also provides a pair of electrical connections between the first and second speaker assembly.

2. Claims: 7-16

According to claim 7 the first speaker assembly further includes an amplification and equalization circuit, including switch means enabling the upper end of the low pass frequency range and/or the phase to be adjusted.

Independent claim 11 comprises all features of claim 1.

Furthermore, according claim 11 the coupling means provides a mechanical and an electrical connection between the first and second speaker assemblies and the first speaker assembly further includes an equalization circuit, including switch means for switching between different sections of the equalization circuit.

Claim 15 relates to a method of selecting and assembling a loudspeaker assembly, the method comprising the steps of

- providing at least three first and second speaker assemblies, with at least one first and one second speaker assembly being present, each first speaker assembly comprising a low frequency speaker and an amplifier for driving the low frequency speaker, each second speaker assembly comprising at least one passive speaker;
- providing coupling means on the first and second speaker assemblies, to enable the first and second speaker assemblies to be connected to each other;
- permitting an end user to select a desired pair of a first and a second speaker assembly; and
- coupling the selected pair together.

PATENT COOPERATION TREATY

In the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

BERESKIN & PARR
40 King Street West, 40th Floor
TORONTO, ONTARIO M5H 3Y2
CANADA

JAN 23 2002
BERESKIN & PARR

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing
(day/month/year) 21.01.2002

Applicant's or agent's file reference
3419-380

JAN 30 2002

IMPORTANT NOTIFICATION

International application No.
PCT/CA00/01067

International filing date (day/month/year)
22/09/2000

Priority date (day/month/year)
22/09/1999

Applicant

AUDIO PRODUCTS INTERNATIONAL CORP. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 eomud

Authorized officer

Teschauer, B



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 3419-380	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/CA00/01067	International filing date (day/month/year) 22/09/2000	Priority date (day/month/year) 22/09/1999
International Patent Classification (IPC) or national classification and IPC H04R1/00		

Applicant

AUDIO PRODUCTS INTERNATIONAL CORP. et al.

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 7 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☐ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 10/04/2001	Date of completion of this report 21.01.2002
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 apmu d	Authorized officer Nieuwenhuis, P 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/CA00/0101**

I. Basis of the report

1. With regard to the elements of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17):*

Description, pages:

1,2,5-16	as originally filed		
3,4,4a	as received on	19/12/2001 with letter of	19/12/2001

Claims, No.:

1-16	as received on	19/12/2001 with letter of	19/12/2001
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Drawings, sheets:

1/7-7/7	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/CA00/010

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.
- ☐ claims Nos. .

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☒ no international search report has been established for the said claims Nos. 1-16.

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

- ☐ the written form has not been furnished or does not comply with the standard.
- ☐ the computer readable form has not been furnished or does not comply with the standard.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/CA00/01067

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. Present claim 1 contains subject-matter relating to originally filed claim 7 and as apparent from e.g. originally claimed 15.

As apparent from the International Search Report the search was limited to originally claims 1-6, belonging to one invention, and not containing any reference to the equalisation as apparent from present claim 1. Originally filed claims 7-16, belonging to another invention, and relating to such an equalisation were not encompassed by the search.

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5 combination of speakers depending upon his or her preferences, recognizing that speaker selection is always, to a significant extent, a matter of personal choice.

10 One advantage of separate subassemblies is that they provide greater flexibility in the initial selection. Also, they clearly enable a user or customer to upgrade the entire assembly by simply adding or replacing part of it. Thus, just the powered subwoofer assembly could be added or replaced, or just the subassembly with the woofer and tweeter speakers.

15 A disadvantage with this arrangement is that, in order to get a true response from the speakers, it requires the controls for the subwoofer to be set, to match the other speakers, and it presupposes that this is indeed possible. For example, controls for a powered subwoofer commonly include a volume or loudness control, phase control and frequency control, limiting the top end of the frequency range. This enables the speakers to be matched to provide the same loudness across the entire frequency range around the speaker assembly. Where the speakers are not from the same manufacturer, 20 it may not be easy to achieve a good match between them. Thus, the volume, phase control and frequency of the subwoofer need to be set, to correspond to the passive speakers. This is difficult to do.

25 Accordingly, what the inventor of the present invention has realized is that it is desirable to provide a speaker system, which combines the benefits of the two approaches outlined above. That is a speaker system should provide the flexibility of having individual subassemblies, both to enable a customer to select desired subassemblies on initial purchase, and to enable addition, replacement or upgrade of just part of the overall assembly. At the same time, such an assembly should provide a mechanism or means to 30 enable the subassemblies to be combined, to form a complete speaker assembly, in which all the speakers are accurately and properly balanced with one another without the need for the user to set controls.

35 U.S. Patent No. 5,802,104, discloses a speaker system. It has a basic rectangular body including speakers and arms extending upwardly and outwardly supporting additional tweeter speaker units or the like. It is intended to reduce baffle effect and increase direct sounds radiated from the speaker units to improve frequency characteristics in the middle frequencies.

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5 Published Japanese Application No. 04245796 discloses a speaker system combining an intermediate/high frequency speaker box and a low frequency speaker box. The intermediate/high frequency speaker box is configured so that its natural width is the same as its depth, and its depth and height are the same size as the low frequency speaker box. This enables the speakers to be joined together in at least two different configurations.

10 Published Japanese Application No. 11004491 discloses a speaker equivalent providing various configurations of guide sections to enable different elements of a speaker system to be mounted together.

15 None of these references address the issue of providing a family of speakers that can be combined in different configurations, with at least some of the speakers having different characteristics. Where speakers have different characteristics, there is the problem of ensuring that, whatever speaker configuration is chosen, appropriate drive signals are provided for each speaker.

20 SUMMARY OF THE INVENTION

25 In accordance with the present invention, there is provided a loudspeaker system comprising: a first speaker assembly; a second speaker assembly; and a coupling means providing a mechanical and electrical interconnection between the first speaker assembly and the second speaker assembly, the coupling means being adapted to interchangably connect the first speaker assembly to a different second speaker assembly having different audio response characteristics from the first-mentioned second speaker assembly, wherein the first speaker assembly includes an equalization circuit for providing a signal to the second speaker assembly, the equalization circuit having an output for connection to the second speaker assembly through the coupling means, wherein the equalization circuit is switchable to provide different outputs, each corresponding to the characteristics of a respective second speaker assembly.

30 Preferably, the first speaker assembly includes at least one first loudspeaker and a first amplifier therefor, and the second speaker assembly includes at least one second loudspeaker.

35

- 4a -

The first speaker assembly can include a speaker adapted to cover a low range of frequencies, and the second speaker assembly can be adapted to cover a higher frequency range.

5 Advantageously, the coupling means provides a pair of electrical connections between the first and second speaker assemblies, for an audio signal from the first speaker assembly to the second speaker assembly, for driving the second speaker assembly. Moreover, the mechanical and electrical connections between the first and second speaker assemblies are preferably
10 integral with one another.

 In a preferred embodiment, the coupling means comprises two pairs of first and second coupling elements, with the first coupling elements being secured to the first speaker subassembly and the second coupling elements being secured to the second speaker subassembly, the coupling elements
15 being complementary and engagable with one another to provide a mechanical connection and being conductive to form pairs of electrical connections.

 The first speaker assembly can include an amplification and equalization circuit, for providing a drive signal to the low frequency speaker and can include a switch means enabling at least one of, the upper end of the
20 low pass frequency range, and the phase to be adjusted.

 More preferably, the amplification and equalization circuit includes a switch means for switching between at least one fixed filter mode, providing set parameters corresponding to a known second loudspeaker assembly, and a manual mode in which the amplification and equalization circuit can be
25 manually adjusted.

 Conveniently, the equalization circuit includes an output section having parameters relating to a desired loudspeaker response and the response characteristics of the low frequency speaker, at least one additional
30 section having parameters corresponding to a desired target response and parameters of a known second speaker system, thereby to give accurate

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CLAIMS:

1. A loudspeaker system comprising:
a first speaker assembly;
a second speaker assembly; and a
5 a coupling means for providing a mechanical and electrical interconnection between the first speaker assembly and the second speaker assembly, the coupling means being adapted to interchangably connect the first speaker assembly to a different second speaker assembly having different audio response characteristics from the first-mentioned second speaker
10 assembly;
wherein the first speaker assembly includes an equalization circuit for providing a signal to the second speaker assembly, the equalization circuit having an output for connection to the second speaker assembly through the coupling means, wherein the equalization circuit is switchable to
15 provide different outputs, each corresponding to the characteristics of a respective second speaker assembly.
2. A loudspeaker system as claimed in claim 1, wherein the first speaker assembly includes at least one first loudspeaker and a first amplifier therefor, and wherein the second speaker assembly includes at least one
20 second loudspeaker.
3. A loudspeaker system as claimed in claim 2, wherein the first speaker assembly includes a speaker adapted to cover a low range of frequencies, and the second speaker assembly is adapted to cover a higher frequency range.
- 25 4. A loudspeaker system as claimed in claim 3, wherein the coupling means provides a pair of electrical connections between the first and second speaker assemblies, for an audio signal from the first speaker assembly to the second speaker assembly, for driving the second speaker assembly.
5. A loudspeaker system as claimed in claim 4, wherein the electrical

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connections of the coupling means includes mechanical connections between the first and second speaker assemblies integral therewith.

6. A loudspeaker system as claimed in claim 5, wherein the coupling means comprises two pairs of first and second coupling elements, with the first coupling elements being secured to the first speaker subassembly and the second coupling elements being secured to the second speaker subassembly, the coupling elements being complementary and engagable with one another to provide a mechanical connection and being conductive to form pairs of electrical connections.
7. A loudspeaker system as claimed claim 3, wherein the equalization circuit comprises an amplification and equalization circuit, for providing a drive signal to the low frequency speaker and including switch means enabling at least one of, the upper end of the low pass frequency range, and the phase to be adjusted.
8. A loudspeaker system as claimed in claim 7, wherein the amplification and equalization circuit includes a switch means for switching between at least one fixed filter mode, providing set parameters corresponding to a known second loudspeaker assembly, and a manual mode in which the amplification and equalization circuit can be manually adjusted.
9. A loudspeaker system as claimed in claim 8, wherein the amplification and equalization circuit comprises an amplification circuit and a separate equalization circuit.
10. A loudspeaker system as claimed in claim 9, wherein the equalization circuit includes an output section having parameters relating to a desired loudspeaker response and the response characteristics of the low frequency speaker, at least one additional section having parameters corresponding to a desired target response and parameters of a known second speaker system, thereby to give accurate compatibility between the first and second loudspeaker systems.

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11. A loudspeaker system comprising:
a first speaker assembly;
a second speaker assembly;
a connection means providing at least one of a mechanical
5 connection and an electrical connection between the first and second speaker
assemblies; and
an equalization circuit in the first speaker assembly including at
least two separate sections for adjusting the frequency response to match
different second speaker assemblies; and switch means for switching between
10 the different sections of the equalization circuit.
12. A loudspeaker system as claimed in claim 11, wherein the
equalization circuit includes at least one section with fixed parameters and at
least one section including manual control of at least one of low pass frequency
range, phase shift and amplitude level.
- 15 13. A loudspeaker system as claimed in claim 12, wherein the
equalization circuit includes subtraction filters.
14. A loudspeaker system as claimed in claim 13, wherein the first
loudspeaker assembly includes an amplifier connected to an output of the
equalization circuit, and a low frequency speaker connected to and driven by
20 the amplifier.
15. A method of selecting and assembling a loudspeaker assembly,
the method comprising the steps of:
(1) providing three or more first and second speaker
assemblies, each first speaker assembly comprising a low frequency speaker
25 and an amplifier for driving the low frequency speaker, and each second
loudspeaker assembly comprising at least one passive speaker, and there being
at least one first speaker assembly and at least one second speaker assembly;
(2) providing coupling means on the first and second speaker
assemblies, enabling each first speaker assembly to be coupled to each second

- 20 -

speaker assembly;

(3) permitting an end user to select a desired pair of a first speaker assembly and a second speaker assembly;

(4) coupling together the selected pair of first and second
5 speaker assemblies.

16. A method as claimed in claim 15, which additionally includes providing an equalization circuit in the first speaker assembly, the equalization circuit including a plurality of filter sections corresponding to different second speaker assemblies and a selection switch, and the method further comprising
10 actuating the selection switch to select a filter section corresponding to the selected second loudspeaker assembly, thereby to provide accurate matching between the response characteristics of the first and second loudspeaker assemblies.

REPLACED BY
ART 34 AMDT.

PATENT COOPERATION TREATY

PCT

REC'D 24 JAN 2002

WIPO

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

12

Applicant's or agent's file reference 3419-380	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/CA00/01067	International filing date (day/month/year) 22/09/2000	Priority date (day/month/year) 22/09/1999
International Patent Classification (IPC) or national classification and IPC H04R1/00		
Applicant AUDIO PRODUCTS INTERNATIONAL CORP. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 7 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☐ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 10/04/2001	Date of completion of this report 21.01.2002
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Nieuwenhuis, P Telephone No. +49 89 2399 8968 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/CA00/01067

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1,2,5-16	as originally filed		
3,4,4a	as received on	19/12/2001	with letter of 19/12/2001

Claims, No.:

1-16	as received on	19/12/2001	with letter of 19/12/2001
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Drawings, sheets:

1/7-7/7	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/CA00/01067

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:
5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):
(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application.
☐ claims Nos. .

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☒ no international search report has been established for the said claims Nos. 1-16.
2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:
- ☐ the written form has not been furnished or does not comply with the standard.
- ☐ the computer readable form has not been furnished or does not comply with the standard.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/CA00/01067

Re Item III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. Present claim 1 contains subject-matter relating to originally filed claim 7 and as apparent from e.g. originally claimed 15.

As apparent from the International Search Report the search was limited to originally claims 1-6, belonging to one invention, and not containing any reference to the equalisation as apparent from present claim 1. Originally filed claims 7-16, belonging to another invention, and relating to such an equalisation were not encompassed by the search.

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combination of speakers depending upon his or her preferences, recognizing that speaker selection is always, to a significant extent, a matter of personal choice.

One advantage of separate subassemblies is that they provide
5 greater flexibility in the initial selection. Also, they clearly enable a user or customer to upgrade the entire assembly by simply adding or replacing part of it. Thus, just the powered subwoofer assembly could be added or replaced, or just the subassembly with the woofer and tweeter speakers.

A disadvantage with this arrangement is that, in order to get a
10 true response from the speakers, it requires the controls for the subwoofer to be set, to match the other speakers, and it presupposes that this is indeed possible. For example, controls for a powered subwoofer commonly include a volume or loudness control, phase control and frequency control, limiting the top end of the frequency range. This enables the speakers to be matched to
15 provide the same loudness across the entire frequency range around the speaker assembly. Where the speakers are not from the same manufacturer, it may not be easy to achieve a good match between them. Thus, the volume, phase control and frequency of the subwoofer need to be set, to correspond to the passive speakers. This is difficult to do.

Accordingly, what the inventor of the present invention has
20 realized is that it is desirable to provide a speaker system, which combines the benefits of the two approaches outlined above. That is a speaker system should provide the flexibility of having individual subassemblies, both to enable a customer to select desired subassemblies on initial purchase, and to enable
25 addition, replacement or upgrade of just part of the overall assembly. At the same time, such an assembly should provide a mechanism or means to enable the subassemblies to be combined, to form a complete speaker assembly, in which all the speakers are accurately and properly balanced with one another without the need for the user to set controls.

30 SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a loudspeaker system comprising: a first speaker assembly; a second speaker assembly; and a coupling means providing a mechanical interconnection

between the first and second speaker assemblies.

Preferably, the first speaker assembly includes at least one first loudspeaker and a first amplifier therefor, and the second speaker assembly includes at least one second loudspeaker.

5 The first speaker assembly can include a speaker adapted to cover a low range of frequencies, and the second speaker assembly can be adapted to cover a higher frequency range.

Advantageously, the coupling means provides a pair of electrical connections between the first and second speaker assemblies, for an audio
10 signal from the first speaker assembly to the second speaker assembly, for driving the second speaker assembly. Moreover, the mechanical and electrical connections between the first and second speaker assemblies are preferably integral with one another.

In a preferred embodiment, the coupling means comprises two
15 pairs of first and second coupling elements, with the first coupling elements being secured to the first speaker subassembly and the second coupling elements being secured to the second speaker subassembly, the coupling elements being complementary and engagable with one another to provide a mechanical connection and being conductive to form pairs of electrical
20 connections.

The first speaker assembly can include an amplification and equalization circuit, for providing a drive signal to the low frequency speaker and can include a switch means enabling at least one of, the upper end of the low pass frequency range, and the phase to be adjusted.

25 More preferably, the amplification and equalization circuit includes a switch means for switching between at least one fixed filter mode, providing set parameters corresponding to a known second loudspeaker assembly, and a manual mode in which the amplification and equalization circuit can be manually adjusted.

30 Conveniently, the equalization circuit includes an output section having parameters relating to a desired loudspeaker response and the response characteristics of the low frequency speaker, at least one additional section having parameters corresponding to a desired target response and parameters of a known second speaker system, thereby to give accurate

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CLAIMS:

1. A loudspeaker system comprising:
a first speaker assembly;
a second speaker assembly; and a
5 coupling means providing a mechanical interconnection between
the first and second speaker assemblies.
2. A loudspeaker system as claimed in claim 1, wherein the first
speaker assembly includes at least one first loudspeaker and a first amplifier
therefor, and wherein the second speaker assembly includes at least one
10 second loudspeaker.
3. A loudspeaker system as claimed in claim 2, wherein the first
speaker assembly includes a speaker adapted to cover a low range of
frequencies, and the second speaker assembly is adapted to cover a higher
frequency range.
- 15 4. A loudspeaker system as claimed in claim 3, wherein the coupling
means provides a pair of electrical connections between the first and second
speaker assemblies, for an audio signal from the first speaker assembly to the
second speaker assembly, for driving the second speaker assembly.
5. A loudspeaker system as claimed in claim 4, wherein the
20 mechanical and electrical connections between the first and second speaker
assemblies are integral with one another.
6. A loudspeaker system as claimed in claim 5, wherein the coupling
means comprises two pairs of first and second coupling elements, with the first
coupling elements being secured to the first speaker subassembly and the
25 second coupling elements being secured to the second speaker subassembly,
the coupling elements being complementary and engagable with one another
to provide a mechanical connection and being conductive to form pairs of
electrical connections.

7. A loudspeaker system as claimed claim 3, wherein the first speaker assembly includes an amplification and equalization circuit, for providing a drive signal to the low frequency speaker and including switch means enabling at least one of, the upper end of the low pass frequency range, and the phase to be adjusted.
8. A loudspeaker system as claimed in claim 7, wherein the amplification and equalization circuit includes a switch means for switching between at least one fixed filter mode, providing set parameters corresponding to a known second loudspeaker assembly, and a manual mode in which the amplification and equalization circuit can be manually adjusted.
9. A loudspeaker system as claimed in claim 8, wherein the amplification and equalization circuit comprises an amplification circuit and a separate equalization circuit.
10. A loudspeaker system as claimed in claim 9, wherein the equalization circuit includes an output section having parameters relating to a desired loudspeaker response and the response characteristics of the low frequency speaker, at least one additional section having parameters corresponding to a desired target response and parameters of a known second speaker system, thereby to give accurate compatibility between the first and second loudspeaker systems.
11. A loudspeaker system comprising:
a first speaker assembly;
a second speaker assembly;
a connection means providing at least one of a mechanical connection and an electrical connection between the first and second speaker assemblies; and
an equalization circuit in the first speaker assembly including at least two separate sections for adjusting the frequency response to match different second speaker assemblies; and switch means for switching between

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the different sections of the equalization circuit.

12. A loudspeaker system as claimed in claim 11, wherein the equalization circuit includes at least one section with fixed parameters and at least one section including manual control of at least one of low pass frequency
5 range, phase shift and amplitude level.

13. A loudspeaker system as claimed in claim 12, wherein the equalization circuit includes subtraction filters.

14. A loudspeaker system as claimed in claim 13, wherein the first loudspeaker assembly includes an amplifier connected to an output of the equalization circuit, and a low frequency speaker connected to and driven by
10 the amplifier.

15. A method of selecting and assembling a loudspeaker assembly, the method comprising the steps of:

(1) providing three or more first and second speaker
15 assemblies, each first speaker assembly comprising a low frequency speaker and an amplifier for driving the low frequency speaker, and each second loudspeaker assembly comprising at least one passive speaker, and there being at least one first speaker assembly and at least one second speaker assembly;

(2) providing coupling means on the first and second speaker
20 assemblies, enabling each first speaker assembly to be coupled to each second speaker assembly;

(3) permitting an end user to select a desired pair of a first speaker assembly and a second speaker assembly;

(4) coupling together the selected pair of first and second
25 speaker assemblies.

16. A method as claimed in claim 15, which additionally includes providing an equalization circuit in the first speaker assembly, the equalization circuit including a plurality of filter sections corresponding to different second speaker assemblies and a selection switch, and the method further comprising

- 20 -

actuating the selection switch to select a filter section corresponding to the selected second loudspeaker assembly, thereby to provide accurate matching between the response characteristics of the first and second loudspeaker assemblies.

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(19) World Intellectual Property Organization
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2,283,029 22 September 1999 (22.09.1999) **CA**
- (71) Applicant (for all designated States except US): **AUDIO PRODUCTS INTERNATIONAL CORP. [CA/CA];**
3641 McNicoll Avenue, Scarborough, Ontario M1X 1G5 (CA).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **HLIBOWICKI, Stefan, R. [CA/CA];** 139 Clappison Boulevard, Scarborough, Ontario M1C 2H3 (CA). **VAN KESSEL, Gord [CA/CA];** 807 Vernon Street, Whitby, Ontario L1N 3C9 (CA).
- (74) Agent: **BERESKIN & PARR; 40 King Street West, 40th Floor, Toronto, Ontario M5H 3Y2 (CA).**
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
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- Published:**
— Without international search report and to be republished upon receipt of that report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **LOUDSPEAKER SYSTEM AND METHOD OF ASSEMBLING A LOUDSPEAKER SYSTEM FROM LOUDSPEAKER SUBASSEMBLIES**

(57) Abstract: A loudspeaker system has first and second loudspeaker assemblies, for example a powered, subwoofer assembly, and a passive subassembly. A mechanical and electrical connection is provided between the two subassemblies. This enables an end user to select different pairs of subassemblies, for matching and use together. To ensure accurate matching between the two assemblies, a filter circuit can be provided in the first subassembly, to filter the signal to the low frequency or subwoofer speaker, to give accurate matching with the known characteristics of passive speakers in the second subassembly. The first subassembly can include a switch to enable switching between different modes, corresponding to different second subassemblies.

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(84) Bestimmungsstaaten (regional): europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Zur Erklärung der Zweibuchstaben-Codes, und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

Veröffentlicht:

— Mit internationalem Recherchenbericht.

bildet, auf dem im wesentlichen in Längsrichtung verlaufende zweite Kugelbahnen (18) ausgebildet sind, drehmomentübertragende Kugeln (14), die in jeweils einander paarweise zugeordneten ersten und zweiten Kugelbahnen geführt sind, und einen ringförmigen, zwischen Gelenkaussenteil und Gelenkinnenteil befindlichen Kugelkäfig (13), der umfangsverteilte Kugelfenster aufweist, in denen die einzelnen Kugeln in einer gemeinsamen Ebene gehalten und auf die winkelhalbierende Ebene zwischen der ersten Achse und der zweiten Achse geführt werden, wobei zumindest die Kugelbahnen eines der Gelenkteile - Gelenkaussenteil und Gelenkinnenteil - einen über der Länge gleichbleibenden Bahnquerschnitt haben, dessen zweite Ableitung vom Bahngrund an stetig und monoton steigend und dessen Krümmungsradius nicht konstant ist und der bei drehmomentfreiem Gelenk einen Kontakt der jeweiligen Kugel mit der Kugelbahn in einem Bereich von $\leq 5^\circ$, gemessen vom Bahngrund, ermöglicht.

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- (21) International Application Number: PCT/CA00/01067 (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
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- (71) Applicant (*for all designated States except US*): AUDIO PRODUCTS INTERNATIONAL CORP. [CA/CA]; 3641 McNicoll Avenue, Scarborough, Ontario M1X 1G5 (CA).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): HLIBOWICKI, Stefan, R. [CA/CA]; 139 Clappison Boulevard, Scarborough, Ontario M1C 2H3 (CA). VAN KESSEL, Gord [CA/CA]; 807 Vernon Street, Whitby, Ontario L1N 3C9 (CA).
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(54) Title: LOUDSPEAKER SYSTEM AND METHOD OF ASSEMBLING A LOUDSPEAKER SYSTEM FROM LOUDSPEAKER SUBASSEMBLIES

(57) Abstract: A loudspeaker system has first and second loudspeaker assemblies, for example a powered, subwoofer assembly, and a passive subassembly. A mechanical and electrical connection is provided between the two subassemblies. This enables an end user to select different pairs of subassemblies, for matching and use together. To ensure accurate matching between the two assemblies, a filter circuit can be provided in the first subassembly, to filter the signal to the low frequency or subwoofer speaker, to give accurate matching with the known characteristics of passive speakers in the second subassembly. The first subassembly can include a switch to enable switching between different modes, corresponding to different second subassemblies.

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INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 802 194 A (KAGAWA YUTAKA ET AL) 1 September 1998 (1998-09-01) column 3, line 61 -column 4, line 59; figures 3-5	1-5
Y	---	6
X	PATENT ABSTRACTS OF JAPAN vol. 017, no. 015 (E-1305), 12 January 1993 (1993-01-12) -& JP 04 245796 A (MATSUSHITA ELECTRIC IND CO LTD), 2 September 1992 (1992-09-02) abstract; figures 1-3	1
Y	---	6
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

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Date of mailing of the international search report

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Nieuwenhuis, P

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA 00/01067

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 04, 30 April 1999 (1999-04-30) -& JP 11 004491 A (SONY CORP), 6 January 1999 (1999-01-06) abstract; figures 4-8	1
Y	-----	6